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AUTHOR Skliar, Norman; La Mantia, Laura
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ABSTRACT

To provide teachers with some of the many activities that can be carried on "just beyond the classroom," the booklet presents plans for more than 40 outdoor education activities, all emphasizing multidisciplinary, inquiry approach to learning. The school grounds offer optimum conditions for initiating studies in the out-of-doors. While every school day of the year should be favorable for some activity, the amount of time spent in the out-of-doors is determined by the particular activity chosen and the individual needs and situations of the student. Students are encouraged to use all of their senses and observe carefully in order to arrive at conclusions. The teacher's role is to direct this inquiry, finding the "teachable moment." The multidisciplinary approach to learning incorporates many academic subjects: mathematics, science, social studies, art, ecology, English, etc. Plans for each activity include a description, list of required materials, step-by-step procedures, discussion topics, and additional follow-up activities. Suggested activities range from sensory nature strolls, scavenger hunts, animal tracks, sand study, earthworms, and root ecology to exploring a sidewalk wilderness, rainfall measurement, curb weed and seed study, bark rubbings, bird watching, shadow study, and air pollution testing.
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Environmental Education Series

activity approach

to just beyond the classroom.



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Division of General Services
Outdoor and Environmental Education

RC 013027

ENVIRONMENTAL EDUCATION SERIES

Activity Approach to Just Beyond the Classroom



Prepared by

Norman Skliar, Administrator
Outdoor and Environmental Education

Laura La Mantia, Staff Assistant

Cover

Lawrence McCue

Board of Cooperative Educational Services of Nassau County
Salisbury Center
Valentines Road and The Plain Road
Westbury, New York 11590

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PREFACE

OUTDOOR AND ENVIRONMENTAL EDUCATION SCHOOL SITE ACTIVITIES

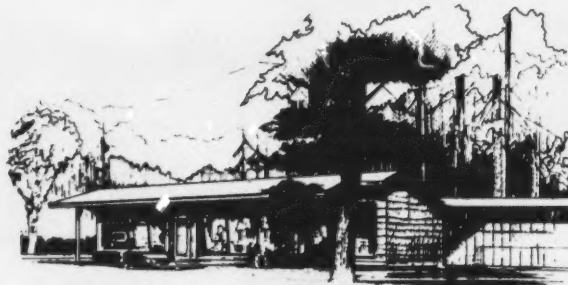
Outdoor education is concerned with direct experiences that utilize the natural environment in an attempt to achieve the goals of education.

The purpose of outdoor education is to enrich, vitalize, and complement all content areas of the school curriculum by means of firsthand observations and direct experiences in the out-of-doors. The out-of-doors provides the setting for deeper insight and a more meaningful and greater understanding of the interrelationship between man and his environment.

The purpose of this booklet is to provide the teacher with just a few of the many activities that can be carried on "just beyond the classroom," where outdoor education really begins.

The school grounds offer optimum conditions for initiating studies in the out-of-doors; the multidisciplinary approach to learning incorporates many academic subjects--mathematics, science, social studies, art, ecology, English, etc. All of these activities place emphasis on the inquiry approach to learning. Students are encouraged to use all of their senses and observe carefully in order to arrive at the conclusions. The teacher's role is to direct this inquiry, finding the "teachable moment," and thereby provide further insight and enlightenment for the student.

The amount of time spent in the out-of-doors is determined by the particular activity chosen and the individual needs and situations of the students. Every school day of the year should be favorable for some activity "just beyond the classroom"--so, SEE YOU OUTDOORS!



WHERE DO I BEGIN? - AN ENVIRONMENTAL MODEL



Description:

Very often, getting started in an outdoor and environmental education program is the hardest part. A particular theme is necessary to coordinate the daily indoor work to outdoor learning. So, where do I begin? One idea which may serve as a working model incorporating every discipline and can be applied to any age group follows:

Begin analyzing the room or building you are standing in. All materials you work with every day come from our environment's natural resources. Nature functions as an interdependent scheme of which man is merely a part.

Man is capable of manipulating nature's scheme. Man is so technologically oriented nowadays that often we overlook our dependency on nature. The history and development of the school itself provide an excellent study showing man's position and dependence in the natural world around us.

Procedure:

- I. What is the school building made of? (brick, plaster, wood, glass, steel, paint)
 - A. Search the school grounds for areas where such raw materials can be found. (soil, sand, trees)
 - B. Where do such materials come from?
 - C. What raw materials make up brick, glass, etc.?
- II. Were the existing trees around the school here before the school was built or planted since then?
 - A. How can we tell? (Tree size--look for tree stumps and count the rings to determine the age of some trees.)
 - B. How long ago was the school built?
 - C. Were any local raw materials used in constructing the school? If imported, where from and why?

III. What are the energy sources of our school? (light--electricity, heat--oil)

A. What natural resources create such energy?

B. What natural energy resources can we find outside the school? (sun, running water) Why are these resources not used here?

C. What is an environmental crisis?

D. How available are all natural energy resources?



IV. Outside the school

A. Look for natural zones that have specific plants. (grassy field, forest edge, forest)

B. What would happen if the grass field were left to grow? (succession)

C. Are there specific animals to be found in the different areas? Why?

D. Look for specific relationships between the plants and animals in an area. (food chain)

ENVIRONMENTAL EDUCATION - A TASK CARD APPROACH

NOTE: Most of the activities found in this booklet may be written in TASK CARD format.

An example of this approach is as follows: Divide the class into four groups (for additional groups, you need additional task cards). Provide each group with a different TASK CARD, giving them sufficient time to "explore" and "collect" in the out-of-doors and then to return to "report" back to the rest of the class.

GROUP 1 - ENVIRONMENTAL EDUCATION TASK CARDS - CONTINUITY & CHANGE

Nature's changes can be noticed during different seasons of the year. Deciduous trees lose their leaves while evergreens hold on to them.

Take a walk around the grounds and find examples of this concept. Bring back one sample of each.

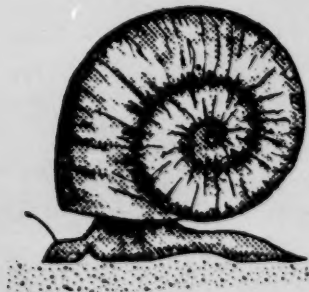
Make up questions (to be displayed with collected specimens) that might lead children to better understand the concept of continuity and change.

GROUP 3 - ENVIRONMENTAL EDUCATION TASK CARDS - MAN'S ACTIVITIES

Find evidences of man's activities and impact on his natural environment.

Make a list of helpful activities and harmful activities.

What suggestions do you have for environmental projects for children in this school?



GROUP 2 - ENVIRONMENTAL EDUCATION TASK CARDS - DECOMPOSERS

Decomposers are specialized consumers which feed on dead organic matter, returning basic substances such as minerals and water to the soil.

Most decomposers are microscopic, but others such as worms, snails and many fungi are also decomposers.

Find evidence of the presence of decomposers.

Collect samples; describe where they were found.
Can you show the before and after of decomposition?
What kind of organism might the decomposer be?

GROUP 4 - ENVIRONMENTAL EDUCATION TASK CARDS - QUADRAT STUDY

Using string and pegs, lay out a 3" X 3" quadrat in the wooded area.

How many plants in the quadrat?

How many animals?

How many different types?

Measure air temperature 1' above ground and soil temperature 3" down.

Soil Characteristics:

Texture - fine, coarse, sandy, other.

Color

Compactness - depth to which a pencil can be inserted.

Porosity - Insert can 1" into soil. Pour measured amount of water into can. Record how long it takes for all the water to saturate into the soil.

AWARENESS OF THE SCHOOL ENVIRONMENT

Description:

Discovering the school environment can be an exciting venture. Individuals do not always become aware of objects found in their immediate environment. Many students look but do not see. They become aware of the environment to the degree that they are afforded opportunities for careful observation.

Procedure:



1. Walk along different habitats on the school grounds. (grass field, shrubs along a fence, ground plants under trees, trees)
2. Collect a sample from each habitat.
3. Compare similarities and differences that are apparent to the "senses" according to the following parameters:
 - Discover objects relating to: texture, which can be described as slick, hard, rough, soft, slimy, velvety, coarse, knobbed, ribbed, furry, hairy, waxy, etc.
 - Discover objects relating to: shape, which can be described as small, large, oval, round, oblong, lobed, ridged, smooth edged, triangular, pointed, curved, billowy, horizontal, expansion, contraction, etc.
 - Discover objects relating to: density, which can be described as spongy, solid, thick, lumpy, hollow, compact, porous, non-porous, etc.
 - Discover objects relating to: temperature, which can be described as hot, cold, damp, clammy, moist, dry, wet, cool, lukewarm, etc.
 - Discover objects relating to: size, which can be described as narrow, large, small, tall, short, thick, heavy, bulky, miniature, etc.

Additional Activities:

1. Invent ways to categorize and classify the items you've collected.
2. Can some things be grouped into related "families"?
3. How is classifying related to other everyday activities?



FINDING DIRECTION

Description:

Students can more easily understand direction, perspective, and location when they experience directional problems out-of-doors on the school playground.

Materials:

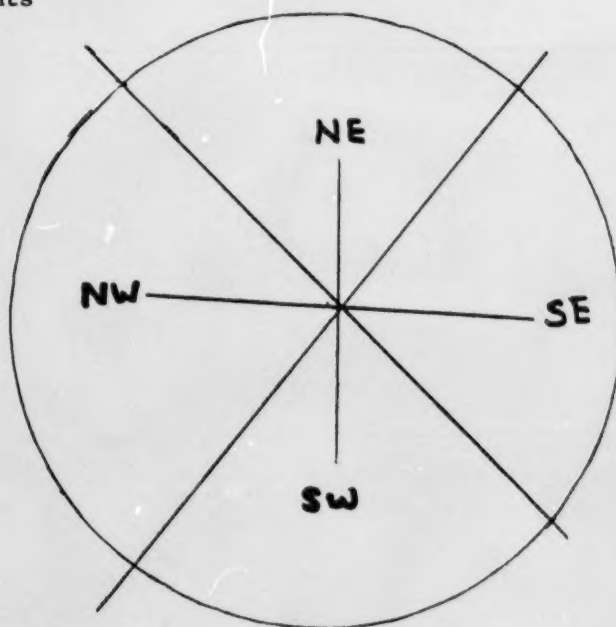
Chalk, compass

Procedure:

Learn how a compass works in the classroom. Then, on a suitable area of outdoors (blacktop) draw a large circle. Use this circle as a stationary compass. Now the students can determine any place on the school grounds and other locations in the community.

Follow-up Activities:

- map of the school or community
- scavenger hunts
- orienteering



SENSORY NATURE STROLL

Description:

For sensory learning, the students use all their senses to learn about the environment--to look at trees, to smell the earth, to touch dried leaves, to listen to bird calls. The teacher can show the students what to touch, feel, and smell. This total involvement with the outdoors offers a refreshing sensitivity to, and understanding of, the environment.

Procedure:

Here are some suggestions for sensory experiences.

The Sense of Smell (close your eyes)--

Break a twig--smell it. Smell a handful of earth. Notice the smell of the woods. What do dried leaves smell like? Crush different types of leaves and smell. Is there a difference? Smell other things in the woods.

The Sense of Hearing (close your eyes)--

Have everyone quiet and just listen to sounds of nature. Ask them "What do you hear?" Leaves rustling in the wind? Bird songs? Crush dried leaves in your hand. What sound do they make?

The Sense of Touch--

Touching things is probably one of the best and most memorable ways to sense nature.

Rub your hands along tree trunks. What does the bark feel like? Does the bark of each tree feel the same or different?

Rub a handful of soil in your hands. What does it feel like? Is it wet or dry?

Touch leaves and twigs. Touch patches of moss. What is smooth? Rough? Round? Pointy? Square? Soft? Hard? Cold? Warm? Wet? Dry?

Feel the wind--feel if it is warm or cool in the woods.

The Sense of Sight--

First, look at the woods. Gaze up, down, all around. Notice shapes and color. Squint your eyes. Now zero in on one object--a leaf, for example. Notice everything about it--color, shape, texture. If you can, make a circle with your fingers. Frame a pretty scene in the woods.

Look at all the plants. But can you find an animal? A bird feeder will help attract birds to the area. Can you find an insect? (Look under the bark of dead trees or logs, under leaf litter.)

SCAVENGER HUNT - SHARPENING THE SENSES

Discussion:

A number of interesting observations may be made on the school grounds. With well-directed questions, the students will "sharpen their senses."

Procedure:

Walk around the school grounds with the question sheet, answering the items as you go.

1. How many homes can you find? _____
 2. How many tracks or signs of animals can you find? _____
 3. How many signs of homemaking can you find? _____
 4. What plants can you find one inch high or less? _____
 5. What signs of man do you find? _____
 6. How many different "feels" can you find? _____
 7. How many different smells can you find? _____
 8. What sounds of nature do you hear? _____
 9. What colors do you find? _____
 10. What do you see moving? _____
 11. What parasites do you find? _____
 12. What evidence of erosion or old fires can you see? _____
 13. Name all of the kinds of trees you see on the school grounds.
-



RECORDING IN A MUSICAL WAY

Description:

Did you ever hear music that created a picturesque scene in your mind? The natural sounds outdoors all contribute to the sense of awareness you gain when standing in a field, on the sidewalk or in the woods. The sounds all differ in tone or pitch. Try to record notations from the sounds you hear around the school.

Materials: lined index cards, pencils

Procedure:

1. Sit in a field near the school. Be very quiet--and listen (close your eyes to heighten your listening ability).
2. When you hear a sound (bird call, chipmunk squeak, or trees rustling), write a check on the index card. The lines at the bottom are for low pitch sounds and the top lines for high pitch sounds. Keep the checks in sequence of sounds. Write the name of the origin of the sound (birds, wind, leaves, etc.).



Sidewalk

✓bird	
	✓wind
✓car	
	✓acorn falling

Discussion:

1. Now look only at the card and try to remember exactly what the "scene" was.
2. Do the same in different areas of the school grounds.
3. Did you hear sounds that you never noticed before?

Additional Activities:

1. Compare the "notes" you've written to a piece of sheet music.
2. Write a story along with the "notes," incorporating your music.
3. Listen to music and try to write "notes" as you did outdoors.

ONION HIKE - SENSITIVITY TO SMELL

Description:

The objective of this activity is to determine how much we take our sense of smell for granted. Have someone mark a trail by rubbing trees, etc., with a fresh onion. Work fast. The smell does not last long.

Materials:

raw onion



Procedure:

- I. 1. Put the area to be smelled on the trees at the same height to make it easier for the students to find. Develop the trail into a circular pattern.
 2. Relate this to how some animals put their smell on a tree or stump so another animal knows what its territory is.
 3. Relate this to people fencing their yards or using posted signs.
- II. There are natural plants on the school grounds which smell or taste like onion. It is garlic mustard. This small ground plant can be found in the woods,
1. Break a leaf off; crush it; smell the onion. Use your senses. Be careful not to pick poison ivy or pull all the plants in the area.

Additional Activities:

Make a random sample of leaves, twigs, and soil to discover the many different scents of nature. Create your own "sense-of-smell" quizzes.



ECOLOGY FIELD WORK



Description:

Ecology is a study of the interrelationships of all living things to their environment. Ecological concepts include food chains and the role or "niche" an animal or plant has in a particular environment. Careful observations of just one living thing (animal or plant) in its natural environment will enable you to develop an understanding of ecological concepts.

Materials: study sheet, ruler, hand lens

Procedure:

Divide the class into small groups to work in a particular habitat of the school grounds [i.e. shady corner of grass field, under some shrubs, in a wooded zone, etc.]. Make close, careful observations and fill in the chart.

FIELD SPECIMEN REPORT

DATE _____ WEATHER _____ SEASON _____ TIME OF DAY _____

PLANT OR ANIMAL OBSERVED _____

SKETCH THE SPECIMEN _____

DESCRIPTION:

SIZE: height _____ width _____ length _____

AGE: estimate _____ color _____

SPECIFIC CHARACTERISTICS _____



ECOLOGICAL DATA:

POSSIBLE FOOD SOURCE _____

POSSIBLE PREDATOR _____

LIVING IN ASSOCIATION WITH _____

SPECIAL ADAPTATIONS _____

OTHER OBSERVATIONS: _____

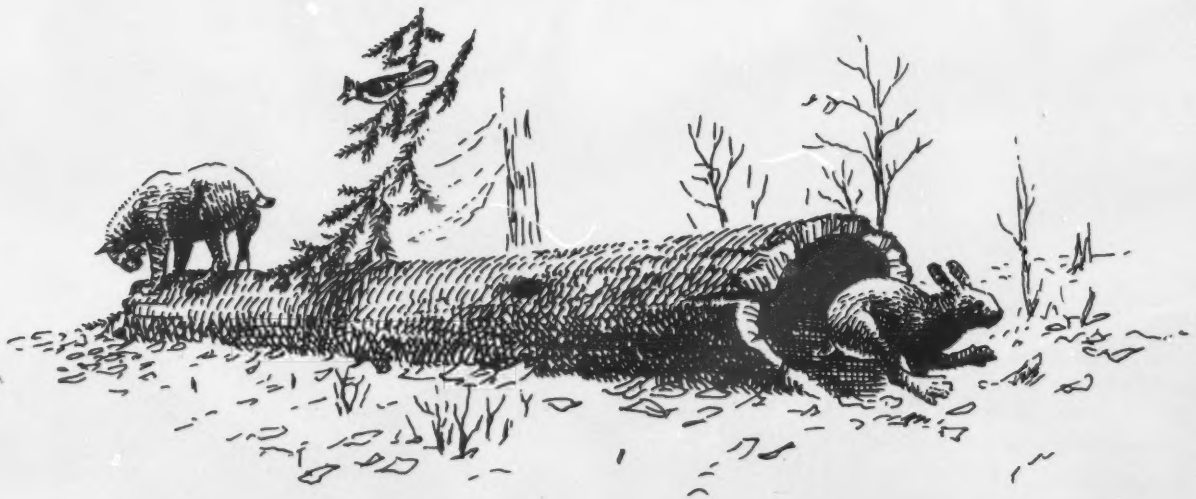
DISCUSSION:

1. Compare the habitat zones that the students have observed.

Compare the data of specimen observed.

What are some ecological relationships of the different specimen?

2. Repeat the study in different seasons of the year, times of the day, etc.
3. Does man play a role affecting the ecological relationships you have observed?



NATURE PHOTOGRAPHY

Description: Photography can enrich and preserve an outdoor experience. Careful observation of nature can sharpen one's senses in the out-of-doors. The experience gained can lead to an enjoyable hobby.

Materials: 4 cameras, film, posterboard, glue.

Procedure:

1. Divide the class into small groups of 4-5, with one camera to each group.
2. Assign each group a topic: follow a series of natural events around the school grounds, i.e. students in the playground, a squirrel climbing a tree, the sun moving in the clouds, an insect walking on a flower, etc., and then display the developed pictures of each group on posterboard.



Discussion:

1. Hide the display of pictures, and have each group list all the details they can remember of their photography experience. Then show the displays to the class. Have each group continue the list of details which were not included.
2. Compare the lists of details! Did the picture show more than they could remember? Is a picture worth a thousand words?

Additional Activities:

Have each group write a story about their display and share the experience with the class. Also, have each group write a story related to another group's display. Each picture may also encourage the students to write a poem.

Return to the same site in all seasons of the school year.

Question: How does a camera work? Compare the functions of a human eye to that of a camera.

ANIMAL TRACKS

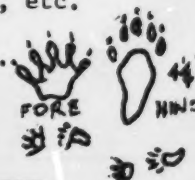
Description:

Tracks of footprints of animals show up best if the ground is wet. Many wild animal tracks can be found near the school. Different tracks will exist in different areas. Almost every track is distinct for a particular animal.

Materials: pencil, chart [field identification guide]

Procedure:

1. After a rainfall, walk to different habitats around the school: baseball field, shrubs near the building, wooded tree area, etc.
2. Look and observe very carefully, tracks left on the ground.
3. Fill in the chart.



	HABITAT	DRAW TRACK	SOIL TYPE	NEARBY FEATURE	ANIMAL
E X A M P L E	Ball field	↓ ↓	SANDY	WEEDS AND GRASS	SEA GULL

Discussion:

1. Why are some animal tracks found in a particular habitat and not elsewhere?
2. Are there additional signs of the animal in the area? [feathers rabbit pellets, etc.]
3. Try to reconstruct the habits and ecology of the animal. What does he eat? Where does he live?

Additional Activities: Make an accurate measurement of the tracks observed. Measure length, depth and width. NOTE claw or tail marks.



ANIMAL CAMOUFLAGE

Description:

Animals and plants are all part of nature's organized food chain. The food chain begins with plants. Some animals eat only plants. Other animals eat only animals. (Man eats both plants and animals.) Many animals of the food chain are protected from being eaten because of their "protective coloration." Example: Green inch worms eat leaves. Hungry birds eat green inch worms. When the inch worm is on a green leaf, the bird may not see him because he blends in with the environment. What might happen to the green inch worm on the brown bark of the tree? Try to find your own examples of "protective coloration." (Note: many animals seen will be insects.)

Materials:

colored toothpicks

Procedure:



Students should work in small groups on the grass field.

1. Throw the toothpicks onto the grass. Observe what colors show up? Why? Collect the toothpicks.
2. Move onto different areas; the soil, the pavement, the cement. Do the same as above.
3. Now look carefully at plants for animals that are the same color of the plant. Are there different colored animals on these? What might happen to them?

Animal Camouflage Chart

(Example)

Animal	Place	How it looks
Caterpillar	Lilac bush by the school fence	Green like the leaves on the bush

SCAVENGER HUNT - GENERAL SURVEY

Description:

A scavenger hunt in the out-of-doors helps to make students more aware of their environment. By looking for the items marked on their lists, students learn to become aware of the natural world around them.

Materials:

scavenger lists and pencils

Procedure:

Students work in teams of 3 - 5. Each team is given a list of things to find and things to do. The first team to complete the list correctly wins. An example of a scavenger hunt developed for one school is as follows:

1. Find where a man tried to save a tree in the school yard. (Cement in holes of stump #2 and stump #4.)
2. Find where a young tree is intertwined in a fence. (Young sassafras tree is winding in and out of cyclone fence - north side.)
3. Find the home of one animal. (Carpenter ant holes in tree stump #1, woodpecker holes near top of tree trunks, squirrel nest in tree.)
4. Find one animal and tell where you saw it. Be observant! Remember insects and birds are included. (Students should be able to sight at least one bird or find some insects in the rotted tree stumps.)
5. Collect four different types of leaves. (There are several leaf types to be found, including oak, birch, beech, hickory, pine, cherry, sassafras. The students do not have to identify each leaf, only recognize that there are different types of leaves.)
6. Listen for one sound of nature and tell what you hear. (Bird calls, wind blowing through tree branches, dead leaves rustling, etc.)
7. Look at the ground all over the school yard and find three places where the ground feels or looks different. (Pine needles on the ground under pine stand, grassy field, bare soil in ball field, leaf-covered ground under trees.)
8. Find the place in the school yard that smells like Christmas time.



SOIL COMPOSITION

Description:

Soil is essential in supporting all plant life. It is a combination of many materials. Students may learn the makeup by examining small samples around the school grounds.

Materials:

trowel or small shovel
white heavy paper
hand lens



Procedure:

Have each small group dig up a small trowel full of soil, placing it on a large white piece of cardboard or paper.

Carefully examine the soil, recording all findings on the chart. A good hand lens will aid in this study. Also, encourage students to feel and smell the soil.

Soil Composition Chart

Area	Composition
(Example) Ball field	Rocks - $\frac{1}{2}$ inch - 1 inch Sand - less than $\frac{1}{4}$ inch Organic matter - leaves, pine needles

SOIL POROSITY

Description:

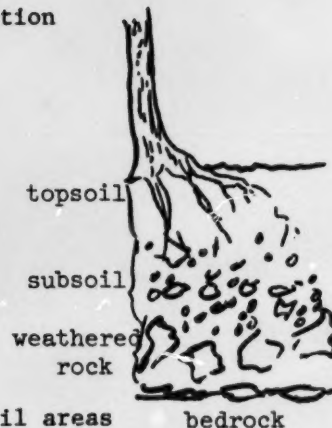
To find the relationship between soil compaction and porosity in the areas studied.

Materials:

- baby food jar
- soft drink can (both ends removed)
- watch with second hand
- large can

Procedure:

Students (3 - 5) locate different natural soil areas around the school. The soft drink can is placed about one inch into the soil. A measured amount of water is poured into the can. Record the amount of time it takes for all the water to saturate into the ground.



NOTE: For Test II - move can into the ground six inches.

SOIL POROSITY CHART

(Example)	Area & Description	Test I	Test II	Average	Explanation

SAND STUDY

Description:

Many school sites have sandboxes or a pile of sand near a field. Sand is made of tiny particles of rocks, glass, and seashells. These particles color the sand.

Materials:

hand lens or magnifying glass, magnet

Procedure:

1. Take a handful of sand and look at it closely with a hand lens. Observe the colors and types of grains.
2. Record your findings on the chart below.

Grain Color	Abundance (%)	Name of Mineral

3. Run a magnet over the sand. Observe.

Discussion:

1. Where do the colored particles of the sand come from?
2. What are the magnetic particles found in the sand?
3. Why are some particles more abundant than others?
4. At a beach, can you observe different areas of the sand that are different colors?

GEOLOGIST'S COLLECTION OF ROCKS

Description:

Rocks of many kinds exist and are formed in many ways. Rocks are the building materials of the earth, forming mountains, valleys, soil, and salt of the sea. We use the materials in rocks in many ways; mining of tin, coal, iron; clays for ceramics; graphite for lead pencils, etc.

Materials:

hand lens, collection bag, rock field guide

Procedure:

1. Collect materials from streambed and shoreline. Select sand grains, pebbles and rocks. Wash these in the stream water.
2. Observe the structure of the sample. Use your hand lens to see tiny particles.
3. Fill in the chart below. (Describe, draw, or name.)

Igneous 'fire rocks'	Sedimentary 'layered rocks'	Metamorphic 'changed rocks'

Discussion:

1. How were the rocks formed?
2. What are such rocks used for?
3. What can we use these rocks for?
4. What are some processes that are used to obtain minerals from rocks?



EARTHWORMS

Description:

The earthworm is a very important animal who lives in the soil. They eat dead leaves and twigs. Their excrement, worm castings, is organic matter that forms soil for new plants to take root in. Earthworms breathe through their skin and get oxygen from moisture in the soil. When it rains, the earthworm has to leave the soil because he might drown. Too much water in the soil will enter the skin.

Materials:

glass jars and caps (with holes punched in the caps)

Procedure:

I - 1. Collect earthworms from the school grounds.

2. Place the worms in a glass jar with soil, leaves and dead twigs. Add a small dish of water. Cover with the cap.

3. Observe how they eat and live, building tunnels in the soil.

II- 1. Collect some worm castings and crush them on a piece of paper.

2. Glue some of the material to the paper.

3. Take some of the surrounding topsoil and glue that to the paper. Write a comparison based on feel alone or looks alone.

4. Are worm castings right next to the wormholes? Observe in an area to find out.

III- 1. How many worm castings can be found in a square 10 feet x 10 feet. Figure out a system for counting them so that they aren't crushed when you're inside the square.



ROOT ECOLOGY

Description:

Roots are a source of nourishment for plants. Roots absorb water and minerals from the soil. Some plants survive with very deep roots, while others have roots that can be seen above the ground. Nitrogen is vital to all plants. Some plants have very particular "balls" on their roots. These contain special bacteria that can take nitrogen from the soil.

Procedure:

- I -
 1. Pull up a dandelion and a tuft of grass. Which gets its moisture closer to the earth's surface? (Are the roots deep or shallow?)
 2. Dig up clover and wash the roots. Look for the nitrogen fixing "balls" on the roots.
 3. Take the clover plant and press it flat. After it is dried (a week), glue it to blank white paper and draw the soil level. Draw arrows showing the nitrogen from the soil entering the roots. This is part of the nitrogen cycle.
 4. What is the nitrogen cycle?
- II -
 1. Find an oak tree and a pine tree. Look for surface roots along the ground. Does one tree have more, less or the same number of surface roots?
 2. Which would survive a hurricane better?
 3. Look for root damage in the school yard. Suggest ways to prevent it.
- III -
 1. Collect pieces of surface roots and tree stems. Compare the structure of these.
 2. Make a cross section of the root and the stem by cutting a thin slice with a razor blade.
 3. Does the root have bark and rings like the tree stem?
 4. Compare root sections with the dandelion and grass.
- IV -
 1. Dandelions have taproots to store food (which is starch).
 2. Take a cross section of the taproot.
 3. Drop iodine on it. The root will turn black if starch is present in it.



EXPLORING A SIDEWALK WILDERNESS

Description:

Sidewalks are a direct result of man's efforts to provide a relatively stable surface upon which to walk. They are found in every community and are readily accessible.

Sidewalk exploration can be a challenging and enlightening experience for students at any grade level for several reasons. The first is due to the fact that the common role a sidewalk plays in our contemporary society does not suggest that it could be used as a laboratory for outdoor learning experiences, and the challenge lies in the problem of determining the questions to ask. This activity in itself will lead to increased perception among the sidewalk explorers and will contribute to the total imagery of the external environment.

Secondly, the location of the sidewalk does not freely suggest that there are indeed many things to explore, discover, and learn. When the sidewalk is explored and things discovered, the student has not only acquired new facts but has improved his ability to carry out investigative procedures. The process of observation, collection of data, analysis of data, and the drawing of conclusions will be applicable to other areas of investigation.

Suggested Areas for Investigation

Mathematics:

- What are the dimensions of the sidewalk?
- Is the sidewalk straight or curved?
- Does the sidewalk slope? If so, what is the percentage of slope?
- What are the dimensions of a sidewalk section? How many sections are there to a known distance such as a city block?
- How much higher or lower is the sidewalk from its surroundings? Why?



Social Studies:

- When was the sidewalk built? Are there any clues that could be a reference point for dating the sidewalk?
- What methods were used for constructing the sidewalk?
- Are the sidewalk materials indigenous or imported from outside of the community or state?
- Does the sidewalk still serve its original purpose adequately?

- Has the sidewalk been rebuilt, extended, or widened? When? Why?
- What can you predict about the sidewalk's future?

Geology:

- What materials are used in the sidewalk?
- What signs of weathering are observed?
- What are the causes of weathering?
- Is there any indication of sidewalk "heave"? Where? Why?

Physics:

- Is there any expansion or contraction? Why?
- What provision was made to allow for expansion of materials?
- Is there evidence of cracks in the sidewalk? What caused them?
- Is the surface abrasive or smooth? Why?

Biology:

- Is there any evidence of plant life on the sidewalk?
- Is there any evidence that the sidewalk provides cover for burrowing animals?
- Do nearby trees and their roots affect the condition of the sidewalk?
- If there are plants growing in the expansion joints, how did they get there?
- Is there evidence of insect life on the sidewalk?



RAINY DAY EROSION

Description:

Rain is one form of erosion which can cause extensive damage to the environment, particularly over long periods of time. Erosion can be seen in downhill gradient areas.



Materials: ruler, chart, pencils

Procedure:

1. After a rainfall, walk around the school grounds and search for signs of rain erosion (i.e., dirt runoff at the edge of a field, exposed tree roots, etc.).
2. Measure the amounts of erosion as best as you can.
3. Record your data on the chart.

Location	Amount	Date
edge of field	1/2"	October

4. Return to the same location at a later time to compare erosion rates.

Discussion:

1. What effect will the erosion have on the location measured?
2. What can be done to prevent erosion?

Additional Activities:

1. How are streams formed? rivers?
2. Compare wind or walking erosion in the same area.

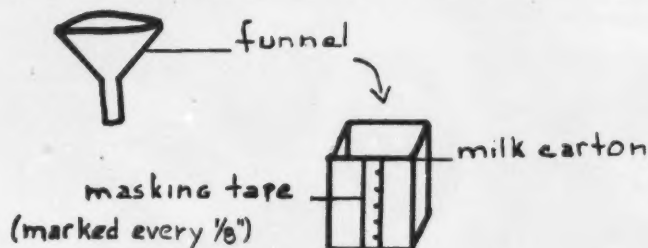
RAINFALL MEASUREMENT

Description:

Rainfall depends on the climate and geography of an area. The amount of rainfall can create drought or flooding. Using the following method - measure the rainfall around your school - for one day, for one week, or for the entire year.

Materials: school milk cartons [with the top cut off], rulers, funnels, masking tape

Procedure: You need to prepare your rain gauge for accurate measurement. Place a piece of masking tape on each milk carton. With a ruler - mark the measuring tape every $\frac{1}{8}$ ". [If you have a baby bottle marked with ounces, you can figure out how many ounces exist for 1 inch of water in your milk carton.]



1. Number or label the milk cartons.
2. Place these cartons at different locations around the school [i.e., in the field, under a tree, under some shrubs, etc.]. Be sure to place the cartons in the soil so they will not be blown over.
3. Place a funnel in each carton. This prevents leaves or particles from going in.
4. Record the amount of rainfall on a chart.

carton	date	amount	location
Alice	JAN. 3	$\frac{1}{4}$ inch	under tree

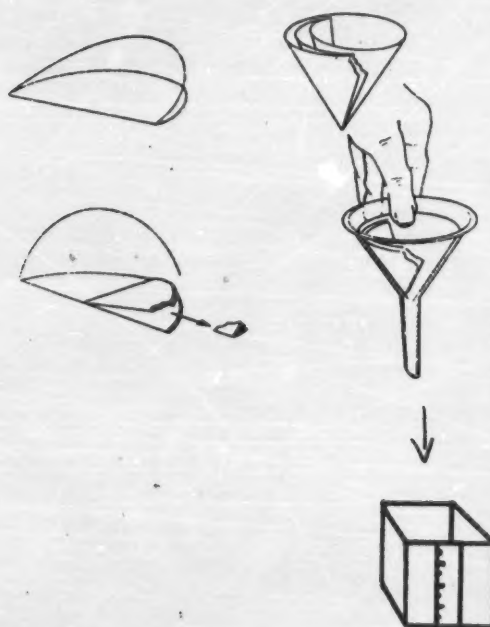
Discussion:

1. Why did one carton collect more rain water than another? 2. Which carton contained the least rain water? Why? 3. What was the average rainfall for that day? 4. Continue the studies for one month or longer and record the amount. 5. Do you live in a dry, tropical or temperate region?

Additional Activities for Rainfall Measurement:

1. Place white filter papers in the funnel.
2. Pour the collected rain water through the funnel to filter out any particles washed from the air.
3. What color is the filter paper?
4. Did the rain wash dust or dirt from the air into the container?
5. Visit a local weather station to see how they measure rainfall and make other weather tests.

Placing The Filter Paper In The Funnel



CURE WEEDS AND SEED STUDY

Description:

Flowers offer two possible activities. Since the flowers produce seeds, the students may use them to study different types of seeds. Students may want to make dried flower arrangements when collecting the plants.

Seed Study: Plants produce seeds in order to reproduce new plants. Each plant produces a seed that is different from other plant seeds. Two interesting variations in seeds have to do with distribution and protection. In order to be distributed, some seeds have wing-like structures, some have hair-like projections. These structures help transport the seed to new areas using wind as the carrying agent. Some seeds (burrs) have hook-like projections which help them to attach to an unsuspecting animal. The animal is the distributor for this seed type.

Seeds also must have some coating for protection from the elements. Some seeds have a fleshy fruit coating and others have hard nut-like coverings; still others have only a thin seed coat.

Procedure:

Have students collect different seeds and observe them closely (hand lenses will help). Fill out the seed chart.

Seed Chart

Draw Seed	Structure for Distribution	Structure for Protection



TREE CHARACTERISTICS

Description:

A great variety of trees exist in and around your school grounds. However, most students and teachers never observe any differences.

Procedure:

Completing the chart below will aid towards "introducing" trees.

This clue chart will then be used in the classroom with a few tree identification books.

NOTE: Many excellent activities and follow-ups are possible from this outdoor activity. What will you do?

Tree Chart

(Example)

Bark Color	Bark Texture	Branches opp.-alt.	Leaf Shape	Leaf Color	Draw Leaf	Other	Name
Dark Gray	rough, loose plates	alternate	narrow - sin- group	Dark Green		Green Nuts	Shag-bark hickory



BARK RUBBINGS

Description:

Trees - Each tree has a distinctive bark. Bark color and texture can be used to identify a tree. Making bark rubbings is a good activity to make students aware of the variety of bark textures.

Materials:

Newsprint paper, crayons, field guide to trees

Procedure:

Place newsprint paper on a tree trunk. Holding a crayon sideways, rub the crayon up and down on the paper. This will yield a distinctive imprint of the tree's bark. As an added activity, you may want to have the students identify the tree, using a field guide to trees.

Rubbings can be done with many items. Make a collection of leaves for a comparative study. (Such leaf designs can be used for stationery, or framed as wall hangings)

Additional Activities

Observe the school grounds and locate other materials which lend themselves to rubbings. (Examples - sidewalk, brick, cornerstones, etc.)



DECAYING TREES - MICROSUCCESSION

Description:

When a plant dies, it gradually becomes an important nutrient of the soil. The decaying tree stump provides territory for many new forms of life. While the process of decay takes several years, you can observe the stages of succession in a few hours.

Materials: study sheet

Procedure: Examine several logs or tree stumps in any one area [grass field, woods, etc.]. Fill in the chart.

STAGE I - Standing Dead Tree



Is there bark on the tree? _____. If so, is it easily removed? _____. What evidence of life do you see? Record observations. _____.

STAGE II - Newly Fallen Tree

Is there bark on the tree? _____. Is the wood beneath the bark (if present) wet or dry, firm or soft? _____. Poke through a section of the log, carefully examining each piece. List all of the animals you find and the number found. _____.

STAGE III - Log Rotting Inside, but Hard on Outside

Carefully lift off outer shell. Examine contents. Note all life. _____.

Rake through the punky part of the log. Note all living things and signs of living things. _____. Are there any runways in or under the log? _____.

STAGE IV - Completely Rotten Log

Rake through the log as in stage three, noting all living things. _____.

GENERAL - What is the most striking difference between Stage I and Stage IV? What plants and animals were necessary? _____.



TREE STUMP STUDY

Description:

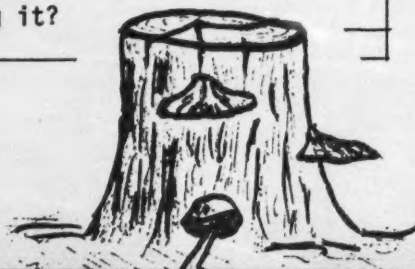
Usually, tree stumps may be found in your area. Tree stumps contain a wealth of life to study. The number and size of the rings of the tree tell the tree's age and history. As a tree stump decays, it is used as a home and as food by numerous plants and animals. The decay process itself shows us how nature recycles all once-living things back to the soil.

Procedure:

Divide the students into groups and have all groups work on a tree stump study sheet. After they have finished, bring the groups together and talk about what they found.

TREE STUMP STUDY SHEET

Rings	How many rings can you count? _____ How old was this tree when it was cut? _____ Are the rings very close together at any one place? _____ Are the rings spread apart at any place? _____ What could have caused this? _____
Animals	Are there any holes in the stump? _____ What made these holes? _____ Look under the bark of the stump. Did you find any animals? _____ Can you find any other signs of animals in or on the stump? _____
Plants	Can you find any lichens (light green patches) growing on the stump? _____ Can you find any fungus (white lumps) growing on the tree stump? _____ Are there any plants growing around the stump? _____ Why? _____
Man	Can you find any signs of man's actions on this stump? _____ How are you affecting the stump by peeling back the bark and studying it? _____



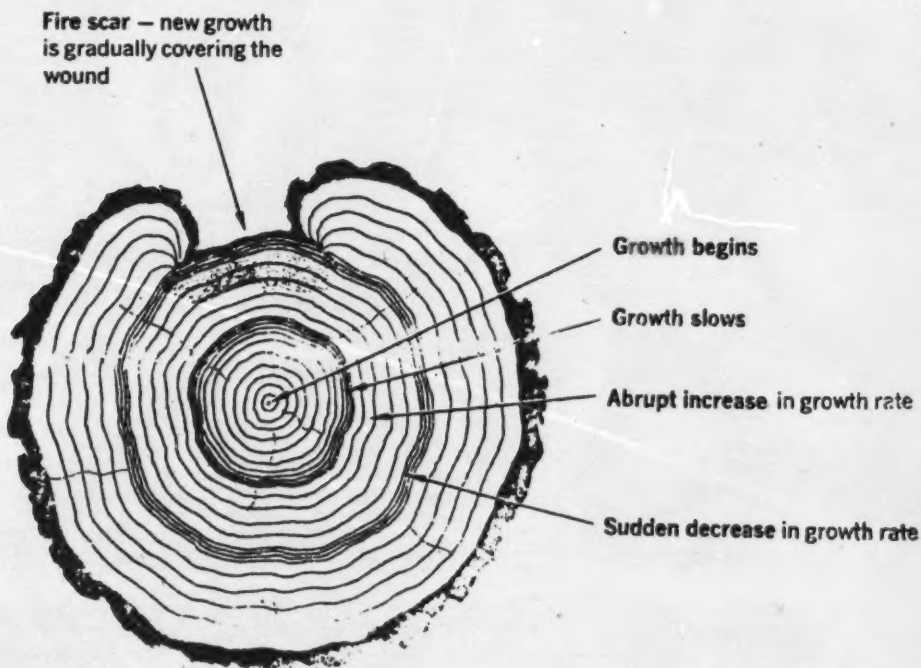
Information To The Teacher:

The number of rings of a tree is equal to the number of years the tree has lived. These rings are tubes (xylem and phloem) that carry water, minerals, and nutrients throughout the tree. New tubes are developed each year, making what appears to be a "ring" in cross section. Wide rings occur when water and nutrients are readily available and when the tree is growing rapidly. Narrow rings occur in periods of drought and disease.

Some tree stumps have small, well-shaped holes in them. These holes are caused by carpenter ants which burrow through the stump, using the tree as a home (not food). Larger, rough-shaped holes may be made by woodpeckers. Under the bark can usually be found sow bugs, millipedes and centipedes.

Lichens appear as light green patches on a tree bark. A lichen is a combination of a green plant (algae) and a non-green plant (fungus) living together in symbiosis. White lumps and white fuzz under the bark are different forms of fungus. Fungus helps to decompose the stump by dissolving and absorbing tree nutrients. Many plants have found protection from the lawn mower at the base of the stump and so there is usually a thick growth of tall weeds at the base of the stumps.

Some stumps have cement filling in holes. This was probably an attempt by man to protect the tree from insects and rotting. Peeling the tree bark off will disturb animal homes but may also hasten the decay process.



SCAVENGER HUNT - MAN-MADE/NATURAL

Description:

A scavenger hunt is a way to instill "directed curiosity" in the students. The hunt is for man-made materials (refuse) dispersed on the school grounds: i.e., paper products, cans, cardboard, etc. The materials are often scattered along the fence.

Procedure:

1. Have several students carry a refuse bag to collect all the rubbish on the grounds. The emphasis can then be placed on the relationship to the pollution of the natural grassland area, pollution by industry, and eventually processes of recycling.
2. Look for decaying plants. Tree stumps are an excellent example to show nature's recycling. The tree is infested with termites, isopods, sow bugs, and fungus (shelf fungus and mushrooms). These all help to decay the plants and trees into humus - a nutrient soil layer.

Discussion:

What would happen if the refuse is allowed to accumulate?

Formation of a garbage dump
Replace room for plants to grow
Replace space in which animals might live

Point out that the refuse did not grow there - it is "man-made."



MATH - MEASURING WITH ESTIMATES

Description: It is very accurate to estimate a measurement. How tall is the school building? How can we find out, without climbing, the height of the building? The following methods are easy and fun. They can provide practical techniques for students to use on their own.

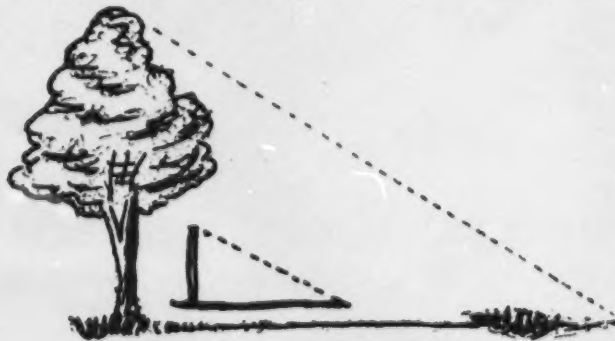
Materials: yardstick, measuring tape, or ruler

Procedure: Divide the class into groups of 4 or 5. Each group may work separately at a designated site. One student in each group will be the "unit of measurement."

- I. Measure the length of the school yard at its longest part using the pacing method. (Note: students must measure the length of the pace of one member of the group. Let him walk across the school yard, counting the paces as he goes. Multiply the number of paces by the length of the student's single pace to get the total length of the field.) A pace is one stride, measured from the heel of the hind foot to the toe of the leading foot.
- II. Measure the height of the tallest tree you can find in the school yard. (Have one student whose height is known stand against the tree. This student is the "unit of measurement." Another student standing away from the tree holds a pencil at arms length. He looks over the top of the pencil to the head of the "unit of measurement." Place the thumbnail on the pencil where the line of sight meets the foot of the person. Determine the number of "units of measurement" fitting onto the tree by moving the pencil upwards a unit at a time.)

Discussion:

1. Compare the results of each group for the designated site measured. Were the answers reliable?
2. Why would you use this "estimate measurement" at home?
3. What were some of the first measuring methods used by man?
4. What is the metric system?
5. Try to map out the school grounds accurately.



QUADRAT STUDY

Description:

A quadrat is a square area. The quadrat method is measuring a square area and marking it with stakes or flags. Within this given area you can survey the population of different plants or animals. You can discover if a plant or animal is most abundant in the quadrat. The quadrat is then a representative sample of an environment.

Succession is when one plant or animal replaces the habitat of another. Many factors affect succession: temperature, wind, sunlight, as well as available water and food.

Materials:

Measuring tape, stakes, (hangars)

Procedure:

Work in groups of 4 - 5. Measure a 3' x 3' quadrat. Carefully observe and count the different plants or animals in the quadrat. Fill in the chart.



Plants	#	Animals	#
dandelion	3	ants #1	9

For Discussion:

1. What type of habitat are you studying? (field, forest, pond or stream edge, under a log, etc.)
2. What characteristics typify the habitat? (direct sun, shade, wind, etc.)
3. What characteristics best typify the soil? (sandy, muddy, dry, covered with leaves or pine needles, etc.)
4. Was one plant/animal dominant in the population?
5. What are succession plants/animals typical of such a habitat?

Quadrat studies can be done so that measuring is not necessary. Recruit wire hangars. Spray paint these red or yellow. Toss these hangars in an area you wish to study. Have students observe and count as suggested above. The hangar marks the boundary of your quadrat. (Red and yellow paint is suggested as they will not blend with the environment and get lost!)

MICROCLIMATES

(The Environmental Conditions of a Restricted Area)

Description:

What is the temperature outside the school today? There is no one answer to this question. In the out-of-doors are found many little climates which will provide opportunities for students to measure these temperature variations and determine why they differ.

Materials:

air thermometers



Procedure:

1. Walk out to the school grounds and select different habitats to work in.
2. Within these habitats - take temperature readings.
3. Record in the chart below.

(Example)

General Area	Specific Area	Microclimates Area of Material	Reading	Explanation
Lower Playground NE (°)	Asphalt Blacktop	-in sun -in shade -white line sun -white line shade	90° F 73° F 80° F 69° F	

WIND VANES

Description:

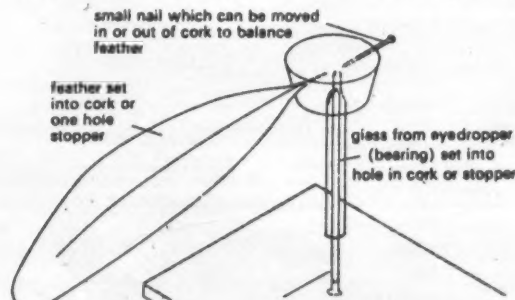
Winds play an important role in the environment. Winds can move the weather causing rain, snow and sunshine. Winds may flow in many directions at the same time. This can be detected by measuring the wind direction at different heights of the same location.



Materials: 1/4" plywood - 4" X 4" in size, 1- 3" nail, 1 - 1 1/2" nail, glass from an eyedropper, cork, and feathers

Procedure: It is easy and fun to construct your wind vane to do activities outdoors.

- Drill hole in center of 4" X 4" X 1/4" plywood.
- Insert 3" nail through this hole.
- Place glass eyedropper over the nail. This is the pivot for the wind vane.
- Make hole at bottom of cork so it will fit on top of the glass eyedropper.
- Place a feather into one side of the cork top and place a nail on the other side. Move the nail in and out until you balance the feather in the cork.



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Now that you have constructed your own wind vane, you can make some simple tests.

- Place the vanes around the school grounds [i.e. along the sides of the building, in the field, etc.].
- Observe for at least 3 minutes.
- Measure the different directions of wind at different heights. (Use a ladder or chair, etc.)

Discussion:

- When the wind vanes are all at the same height, does the wind blow in the same direction? Why?
- What caused different wind directions at different heights?
- How do trees, fences and shrubs affect wind?

MEASURING WIND SPEED

Description:

Wind speed can not only cause changes of weather, but bring a storm into your area within a very short time. Wind speed can differ among the sites of the school grounds. Wind speed is measured with an anemometer. Construct your own anemometer to record the changes of wind speed around the school.

Materials: 4' X 4" of 1/4 " plywood, 1 - 3" nail,
1 cork, 4 sticks, 4 paper cups,
1 glass eyedropper



Procedure:

- Drill hole in the center of the plywood.
- Insert 3" nail through this hole.
- Place eyedropper over the nail. This is the pivot for the anemometer.
- Make hole at bottom of cork so it will fit on top of the glass eyedropper.
- Stick the paper cups on the sticks. Paint one cup to differentiate it from the others.
- Poke the sticks evenly into the cork. (refer to diagram)
- To measure wind speed: count the number of turns of the anemometer for 30 seconds. Divide by 5 to obtain miles per hour.

Now that you have constructed your own anemometer:

- Place the anemometers at different areas outside.
- Keep all anemometers on the ground. Observe and record on the chart.
- Lift all the anemometers to shoulder height. Observe and record.
- Do the same at different heights. (Use a ladder or chain.) Be sure to measure the height of each reading. Fill in the chart.



SITE	SPEED	HEIGHT	DATE
next to playground	.6 mph	2 1/2 feet	11/30/71

Discussion: 1. What causes different wind speeds when the anemometers are placed at the same height? 2. What are natural wind obstructors along the school grounds? 3. What are man-made wind obstructors?

Additional Activities: 1. Measure the differences in wind speed for a number of days and for each season. 2. Observe weather changes, cloud movement along with the anemometer recordings. 3. Visit a local weather station to observe anemometers and other weather instruments.

BIRD WATCHING

Description:

By listening carefully, getting as close as possible, looking as long as they can, and seeing as much as they can, students can make wonderful discoveries about birds. Sometimes a tree or a large bush outside the classroom window can be fine areas for observation. Great helps are a pair of field glasses and simple feeding stations such as a pine cone stuffed with peanut butter and oatmeal or a big glass jar of seeds and crumbs hanging from a tree. A simple tray attached to a windowsill can be effective too.

Procedure:

Instruct students in the art of bird watching and the need for quiet observation. One student at a time should be assigned to the "bird watching place" and allowed to record his findings in the "bird record book" kept there; or, each student may start his own record book and make observations at school and at home.

Bird Record Book

(Example)

Date	Place	Where	Size	Color	What Eating	Sounds	Facts	Name
12/4/39	School Yard	Side of Tree	Smaller than Sparrow	White Breast, Black cap, Grey back	Suet	Whee whee	Hung Upside Down	chickadee

BIRD CHARACTERISTICS

A variety of interesting birds are found in and around the school grounds. To enhance this observation, a bird feeder may be used. NOTE: If you begin to feed in the fall, continue throughout the winter.

Bird Clue Chart

(Example)

Size	Color & Markings	Shape	Environment & Activity	Flight (sweep)	Song	Name
About 12"	Brown, spotted Gray head with red on nape of neck	Plump, bill long and pointed, stiff tail	Against tree top branches + on ground eating ants.	Undula- ting	Loud "laughing"	

After completing "clues" for particular bird, consult any good bird identification book for the name, i.e., Peterson or Singer guide.

Clue Reference:



- | | |
|----------|----------|
| 1 Beak | 6 Tail |
| 2 Throat | 7 Rump |
| 3 Crown | 8 Wings |
| 4 Nape | 9 Breast |
| 5 Back | 10 Feet |

Size: Sparrow-6 inches, Robin-10 inches, Crow-20 inches

Shape: Body-slump, sleek, stubby
Head and bill
Tail-rounded, pointed, square
Wing-rounded, pointed, ragged

Environment & Activity: Where was bird and what was it doing?

Flight: Most birds have a particular flight characteristic, such as darting, swooping, straight, undulating...

BIRD TRACKS AND PLASTER CASTS

Description:

Plaster casts can easily be made of most animal tracks, including those of birds. Using simple materials, your students can make permanent casts of bird footprints.

Materials:

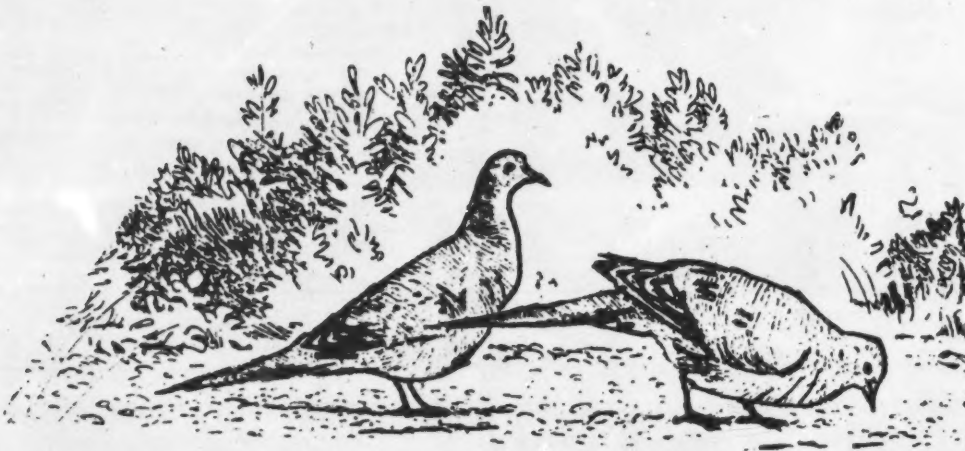
Light cardboard or oaktag, plaster of paris, paper clips, bird feeder, bird seed, field guide to the birds (optional)

Procedure:

For best results, set up a feeder in your school yard. Fill the feeder with wild bird seed. Spread a layer of topsoil under the feeder. Water down the soil so that any tracks made will be clear and will last for a time. Birds will be drawn to the feeder and some seed will spill to the ground. Many birds will feed on this fallen seed, leaving numerous footprints in the wet mud.

To make castings of the tracks, cut strips of light cardboard 2" x 14". Make a loop with the cardboard, fastening with a paper clip. Place the loop around a track, pressing down so that it sets in the soil about 1/4" down. Make a mixture of plaster of paris and water, pour the mixture into the mold, and let set for about 20 minutes. After the plaster has hardened, lift from the ground, and brush off any dirt clinging to the cast. This will result in a permanent print of the animal's track.

You may want to identify the bird that made the track. This can be done by observing which birds feed on the ground and immediately checking their tracks.



SHADOW STUDY

Description:

The shadow of a stationary object can be used to study how the sun's position in the sky relates to both the time of day and the time of year. The sun's position in the sky changes on a daily basis as the earth rotates on its axis. The sun's position in the sky also changes on a seasonal basis as the earth revolves around the sun.

Materials:

String or chalk

Procedure:

Use a pole or stick located on the school grounds. Have the students observe the position of the pole's shadow at a specific time during the day, say 10:00 a.m. Have them mark the shadow location on the ground with string or chalk. An hour later, observe the shadow again and mark its location. Have the students observe and mark the pole's shadow a month later, same time of day as previous observation.

Questions to the Students:

1. What causes the shadow?
2. Will the shadow move in one hour or will it stay still? Why?
3. Will the shadow get bigger, smaller, or remain the same in one hour? Why?
4. Will the shadow be in the same spot one month later? Why?
5. Will the shadow be bigger, smaller or remain the same in one month's time? Why?



AWARENESS AND CREATIVE EXPRESSION

Description:

The continued awareness of our national surroundings should be constantly cultivated in students. Creative expression allows for the communication of one's feelings, thoughts and impressions.

Allow a quiet time out-of-doors on the school grounds. Suggest closing eyes, remaining silent, etc., in order to emphasize one of the five senses at a time. Encourage creative expression, be it verbal or written.

Below are some examples of poetry that can be used.

HAIKU

Over a thousand years ago the Japanese invented this simple, melodic form of poetry to express their feelings about the natural world. After experiences of intense contemplation these precisely worded, unrhymed little pictures of beauty provided perfect nature poetry.

Form: three lines of 17 syllables, usually five syllables, seven syllables, five syllables. Examples:

The birds are chattering,
The freshness of earth and life.
The love of life.

The leaves are falling,
Red, yellow, golden and brown.
Fall is coming soon.

CINQUAINE or PYRAMID POEM

A Cinquaine or Pyramid Poem is a five line poem.
The first line is one word: the title.
The second line has two words: description of the title.
The third line has three words: describing an action.
The fourth line has four words: describing a feeling.
The fifth line has one word: a synonym for the title.



Examples:

Tree
Tall, green
Waving branches, bending
Living strength, rooted deep
Life.

Pond
Water oasis
Splashing, rippling, quiet
A place to think
Reflections.

Preserve
Nature's place
Seeking, growing, adapting
Plant and animal environment
Muttontown.

Mud
Squishy, squashy
Shoes getting wet
Oozing brown and thick
Muck

ART APPRECIATION

Description:

Art appreciation in the outdoors involves all senses; feeling, hearing, smelling, touching, and maybe even tasting. Nature is art. The school grounds lends itself to many creative activities. Have you ever smelled a plant that smells green?

Materials: (vary with activity)

chalks, watercolors, pads, charcoal

Procedure:

1. Bring a palette, pad, and paints with you outside. Select a plant, animal or an entire open view to paint. Try to exactly match the colors you see.
2. Sketching different perspectives of a view provides a lesson in looking. Sketch the entire field. Then select a corner of the view, or one particular tree, and sketch this in greater detail.
3. Do the above at different times of the day, different seasons of the year. The sunlight changes constantly, offering new perspectives entirely.
4. Find a tree. Instead of painting the tree itself, paint the shadows of the tree, its leaves, etc.

Vary the medium you are working with as an additional comparison study.



ARTS AND CRAFTS

Description:

Nature's materials can be used in many ways to create wall decorations, paper weights, table arrangements, etc. It's as simple as collecting natural materials, rocks, leaves, acorns, pine cones, twigs, bark, and shells.

Materials: (vary with activity)

rocks, field flowers, driftwood, twigs, felt, glue, scissors

Procedure:

1. Collect stones and glue them together to form figures, animals, etc. Paint these or paste designs or felt pieces to add detail and final touches.
2. Collect acorns and pine cones to rearrange in shapes--boats, trees, holiday decorations. Add glitter or ribbons or whatever is needed.
3. Dried flower arrangements can be made in all creative designs. For three-dimensional table pieces, use driftwood, dead twigs and bark. To dry wild flowers, hang them in a bunch upside down. Some plants need special drying technique. (Refer to resource book.)
4. Wall decorations can be made easily. Collect twigs, bark, or wood to make a frame. Use felt or a paper glued on cardboard for a backing. You may want a three-dimensional wall hanging of rocks, shells, etc. (Make sure the objects are glued securely.) For plants, you may want to dry and press them flat. If you don't have a plant press, place flowers, leaves, etc., in newspaper. This absorbs the plant moisture. Then place newspaper between a book. Weigh the book down so the plants are pressed flat. Wait about a week and the plants will be ready to be framed. You can also use these plants for stationery. Iron wax paper over the plant on your stationery paper. This is fragile, but beautiful.



SNOW AS AN INSULATOR

Description:

Snow is frozen water. All snowflakes are hexagonal in shape because of the nature of the molecule. When the snow blankets the earth, it maintains the ground temperature at 32° F. If the air temperature is above or below 32° F., the ground beneath the snow will be 32° F.



Materials: air thermometer, trowel

Procedure:

1. Take the air temperature in different locations around the school.
2. Take the air temperature at the surface of the snow.
3. Insert the thermometer into the snow for a temperature reading of the snow itself.
4. Dig through the snow to the ground. Take the temperature just at the surface of the earth.

Fill in the Chart

Location	Air ° F.	° F. at surface of snow	° F. in snow	° F. -ground

Discussion:

1. Why is the ground temperature at 32° F. when the air temperature is not?
2. Is the snow melting in the sun?
3. Is the snow evaporating in the sun?
4. Try a comparative study both in the sun and in the shade.

Additional Activities:

1. Compare the life styles of the Eskimos living in the snow to your home styles.

SNOW AND LIGHT REFLECTION

Description:

White reflects all light rays, while black absorbs all light rays. Material of the color spectrum "Roy G. Biv" [red, orange, yellow, green, blue, indigo and violet] reflect and absorb light differently.

Materials: colored construction paper

Procedure:

1. Locate a flat area around the school that is covered with snow.
2. Place different colored sheets of construction paper next to each other on top of the snow.
3. Wait 1/2 hour and lift the sheets of paper. Observe.

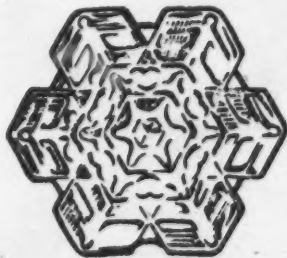


Discussion:

1. Under which color did the snow melt the most? The least?
2. What do the colors have to do with absorbing light? Reflecting light?
3. Look around you and notice the colors of the coats of your classmates. What are the most common colors? Why do you think this is?

Additional Activities:

1. You can measure the effect of different types of objects as well as different colors on snow. Collect objects from the classroom. Place these on the snow.
2. Be sure to record as many factors as possible that may cause the different objects to melt snow (i.e., weight, size, etc.).



STREAMS

What is a stream? It is a flowing body of water that eventually runs out to the sea bringing materials with it. The study of running water is only a minute phase in the study of fresh waters.

There are many different kinds of streams. The nature of stream life depends on:

- a) the origin of the water creating the stream (a lake, an underground spring, rain and/or snow runoff, field or hillside runoff).
- b) the ground or bedrock material (clay, sand, mud, gravel, etc.)
- c) mixing of gases from the atmosphere.

The physical shape of the stream is an indication of its age; straight flowing streams are young, whereas meandering, curving streams are older and slow moving. The stream may have calm pools and rippling water over rocks.

Special features of stream life can be observed:

1. streamlined body shape, flat and slender
2. adaptations for clinging onto rocks and bottoms (suckers)
3. adaptations for burrowing in muds
4. adaptations for straining water for food capture

Plants need to be able to anchor roots tightly along the bottom and shores. Some plants do float along the surface.



Variations in structure as well as life in the stream occur with the changes of seasons during the year. Spring and fall provide the most abundant activity in the stream. Comparisons can be made throughout the year.

Streams flow as a means of transportation and energy source provides additional topics of study.

It is suggested to split the class into small groups for working at the stream. Each group's data can be compared for the areas of the stream studied.

STREAM MAPPING

Description:

All new studies should include mapping to provide an overall view of the study site. Stream mapping is specialized in that it requires "depth" readings of water.

Materials:

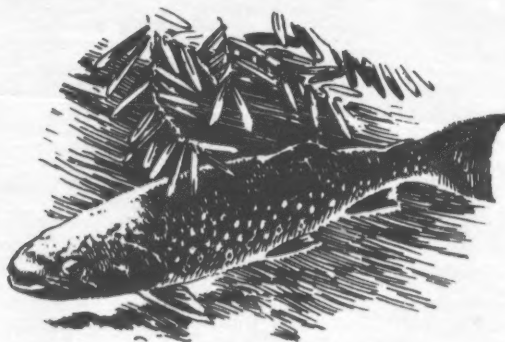
yardstick, measuring tape

Procedure:

1. Using the measuring tape, measure the length of the stream. Mark off three-foot intervals along the stream. (Use a rock, or flag, or stick to mark.)
2. Use the yardstick to measure the width and depth of the stream at each marker.
3. Draw the stream according to these measurements, estimating the curves as you go.
4. This is a good time to sample the soils at the shoreline and stream bottom.

Discussion:

1. What kinds of rocks are there?
2. Is it sandy? Muddy? What does this tell you?
(Muds are formed when dead material is decomposed and collects at the bottom.)
3. Is the stream young or old?



STREAM COLLECTION ANALYSIS

Description:

The variety of animal and plant life may differ along different points of the stream — calm pools or rippling water. You will be able to find some links of a food chain. Examples: plants, plankton (small and microscopic plants and animals), insect larvae and adult insects, worms, frogs, fish, possible birds overhead, and man.

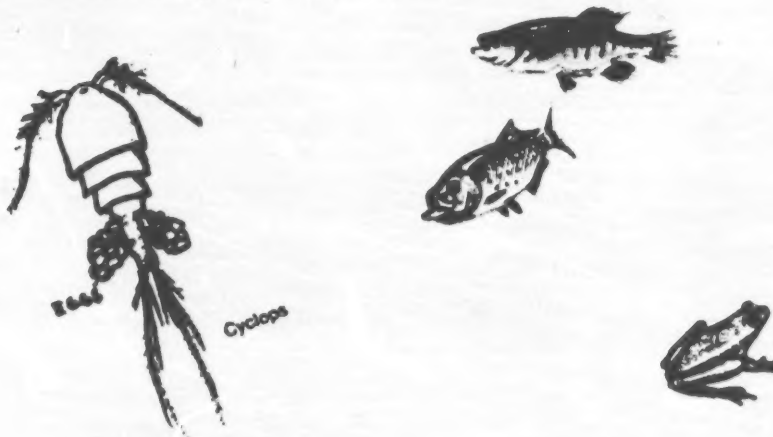
Materials:

collecting nets (dip net and plankton net*), white pails or white trays

*A plankton net is a fine mesh net with a collecting tube at the end of it.

Procedure:

1. Use the dip net to sweep up the life in the water. Sample the water surface, middle layer and bottom with the net.
2. Observe carefully all the living and nonliving matter, particularly in the mud. Many mud animals are well-camouflaged and hard to see.
3. Slowly drop the plankton net under the water. Large plankton animals can be seen by the eye. Closer observations can be made by placing the water sample on a depression slide. Observe this under a microscope.



STREAM FLOW

Description:

An important characteristic of a stream is its stream flow, or velocity. Swiftly moving water deposits very little along the stream bottom. Special plants and animals are adapted to live only in swift waters. The materials are carried downstream.

Materials:

corks or Styrofoam squares, stopwatch, yardstick

Procedure:

1. Measure 3' intervals along the length of the stream with the yardstick. Mark the stations with a rock or stick.
2. Station students at the markers to be observers.
3. Drop the cork or Styrofoam squares from the starting point of your stream.
4. Using the stopwatch, time how long it takes for the cork to travel to each designated marker.

Discussion:

1. What is the stream flow from marker to marker?
2. What is the total stream flow?
3. What is the average stream flow?



STREAM ALGAE STUDY

Description:

Algae are primary producers and the first link of food chains. Algae grow on the water's surface, stream's edge, along rocks, etc. Excessive algae growth in a stream may indicate a disruption of the food chain. The animals which feed on the algae may not be present. Household detergents containing phosphates that are washed into streams cause an increase in the production of algae. Phosphorous is an important element for plant growth. Excessive algae growth may overgrow a stream and thereby "pollute" it.

Materials:

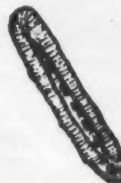
dip nets, pails, white heavy paper, glue

Procedure:

1. Collect samples of the algae from different areas along and within the stream. Observe.
2. Put the algae on white paper. Spread it out and allow it to dry. The algae will stick to the paper as it dries. Some glue can be used if necessary.

Discussion:

1. How many different kinds of algae do you see?
2. Are they from special zones of the stream?
(A field guide to fresh water algae will help in identifying the names.)



OBSERVATIONS OF LIFE IN A GRASSY FIELD

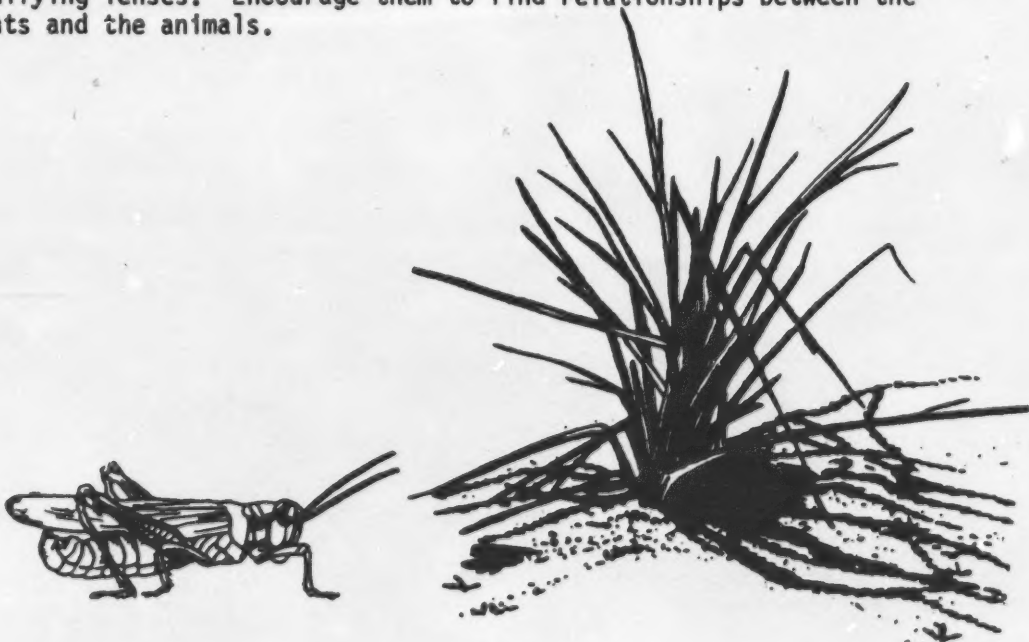
Description:

Students may run and play on a grassy field at school day after day and never become aware of the unique community of living things that are adapted to life in this open, grassy habitat. Exploration and discovery within this familiar area can be a challenging outdoor experience.

Procedure:

Broadly survey the field with your students asking them to observe everything they can. What do they see? hear? smell? feel? Tell them that there are many wonders right under their feet and that they cannot know unless they explore and observe as scientists do. Let each student choose one part of the field to study in detail. If the children are able, encourage them to take notes and keep records. A good way to begin is to have each student stretch out flat on his stomach and look down into the grass right under his nose. Have them name everything they see (different kinds of grass, bare spots, white stones, ants, clover, a walking beetle, leaf, a dead bee).

If possible, let the students study this world amid the grass with a hand magnifying lenses. Encourage them to find relationships between the plants and the animals.



A TEST FOR AIR POLLUTION

Description:

The air you breathe contains many gases and particles. Air pollution is of serious concern to all living things. You may not always see pollution, but you can collect particles of dust, silt and dirt which settle from the air.

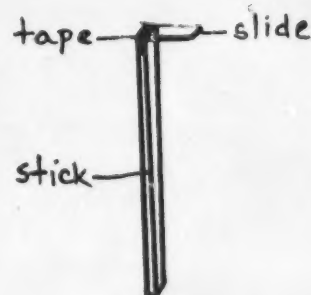
Materials: microscope slides, sticks, vaseline, tape

Procedure:

1. Apply a thin layer of vaseline to a slide. Using tape, attach the slide to a stick.
2. Do this with several sticks and number each one. (See diagram.)
3. Place the sticks in the ground at different areas of the school grounds (near parking lot, furnace, field, woods, etc.).
4. Leave the stick and slide for a few hours or a few days. Observe the amounts of particles that collect.

Fill in the chart

	area	amount	color
slide 1			
slide 2			
slide 3			
slide 4			
slide 5			



Discussion:

1. What is air pollution?
2. Where does it come from?
3. Compare the amounts of particles you collect from one area to another. Why does one slide have more particles than another?
4. Are there other kinds of pollution around the school (cans, papers, noise [trucks, airplanes])?

Additional Activities:

1. Visit a nearby industrial plant to see a production process. Where do the waste products go? Is there a lot of smoke from the chimney? What color is the air exhaust?

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